



# PATENT SPECIFICATION

## DRAWINGS ATTACHED

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Inventor: DOUGLAS ERIC RICHARD FOX

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### COMPLETE SPECIFICATION

#### A Machine for the Administration of Anaesthetic Gases or for the Ventilation of a Patient

We, CAPE ENGINEERING COMPANY LIMITED, a British Company, of Cape Road, Warwick, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a machine for the administration of anaesthetic gases or for the ventilation of a patient.

The invention provides a machine for the administration of anaesthetic gases or for the ventilation of a patient, the machine including pumping means, such as a negative phase bellows, for effecting expiration of gas from the patient, ducting for conveying expired gas from the patient to said pumping means, a branch pipe leading from said ducting, a selector valve operable to permit gas expired by the patient to flow either through said branch pipe or through the portion of the ducting downstream of the junction therewith of said branch pipe, and means for connecting said branch pipe to a spirometer, or equivalent apparatus, for measuring the volume of expired gas or rate of expiration, or to a sampling device, whereby a sample of gas expired by a patient can be tested or analysed.

A non-return valve may be provided upstream of the junction of the branch pipe and said ducting to prevent expired gas from flowing back to a patient during the positive phase of operation of the machine.

The ducting may form part of a closed or an open circuit connected with a face-mask or equivalent means for administering anaesthetic gas to or for ventilating a patient.

Where the pumping means for effecting expiration of gas is a negative phase bellows the latter may be manually operable or be arranged to be cyclically operated in timed relation to a control valve positioned up-

stream of said bellows.

By way of example, an anaesthetic machine or ventilator having a branch pipe in accordance with the present invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a circuit diagram of the anaesthetic machine or ventilator, showing the selector valve provided by this invention in its closed position, and

Figure 2 is a part of the circuit diagram shown in Figure 1 illustrating the selector valve in its open position.

The circuit diagram shown in Figure 1 illustrates an open-circuit anaesthetic machine or ventilator comprising *inter alia* an inlet duct 1 leading to positive phase ducting 2 including a positive phase bellows 3 and a mechanically-operated control valve 4, an outlet duct 5 communicating with negative phase ducting 6 including a negative phase bellows 7 and a mechanically-operated control valve 8. The portions of the ducting 2 and 6 shown at the right hand side of the valves 4 and 8 respectively are connected to a common pipe 9 to be applied to a patient either by means of a face-mask or in some other way. The inlet duct 1 and the outlet duct 5 may communicate with atmosphere or with a source of an anaesthetic gas and with atmosphere respectively or they may be connected together in a closed circuit. An oxygen inlet 10 leading to the ducting 2, and a re-breathing bag 11 are also shown. The positive and negative phase bellows and the valves 4 and 8 are arranged to be cyclically operated relatively to one another by a common shaft 12 driven by an electric motor 13 and reduction gear 14. A valve-controlled by-pass 15 is provided across the negative phase bellows 7. Several non-return and relief valves are also shown. All the parts of the machine

and its circuit described hereto are already known. Furthermore, the circuit may be varied in any known manner, particularly where the anaesthetic machine is to have a closed circuit.

In accordance with the invention, a branch pipe 16 leads from the ducting 6 between a non-return valve 17 and a pressure relief valve 18 positioned between the valve 8 and the negative phase bellows 7. Flow of expired gas through branch pipe 16 is controlled by a two-position, manually-operable selector valve 19. In the closed position, shown in Figure 1, of the selector valve 19, expired gas flows normally through the ducting 6 or the by-pass 15 and cannot leave the ducting 6 through the branch pipe 16. In the open position, shown in Figure 2, of the selector valve 19, expired gas flows from the ducting 6 through the branch pipe 16 and does not flow towards the negative phase bellows 7.

The downstream end of the branch pipe 16 is arranged to be connected to a spirometer 20, or other apparatus, for measuring the volume of gas expired by the patient or at the rate of expiration, or for taking a sample of expired gas for testing or analysis.

Before use of the anaesthetic machine, the downstream end of the branch pipe 16 may be connected to the spirometer 20 or said other apparatus. The selector valve 19 is set for normal flow through the ducting 6 towards the negative phase bellows 16. When the anesthetist wishes to measure the volume of gas expired, the rate of expiration or to take a sample of the expired gas he can operate the selector valve 19 to divert temporarily the expired gas to the spirometer or said other apparatus, from which the gas will flow to atmosphere.

Instead of providing the cyclically operated valves 4 and 8 and the motor driven bellows 3 and 7, circulation of gas through the ducting of the circuit and the patient may be performed by manual operation of a re-breathing bag or equivalent pumping means.

#### WHAT WE CLAIM IS:—

1. A machine for the administration of anaesthetic gases or for the ventilation of a patient, the machine including pumping means, such as a negative phase bellows, for effecting expiration of gas from the patient, ducting for conveying expired gas from the patient to said pumping means, a branch pipe leading from said ducting, a selector valve operable to permit gas expired by the patient to flow either through said branch pipe or through the portion of the ducting downstream of the junction therewith of said branch pipe, and means for connecting said branch pipe to a spirometer, or equivalent apparatus, for measuring the volume of expired gas or rate of expiration, or to a sampling device, whereby a sample of gas expired by a patient can be tested or analysed.

2. A machine as claimed in Claim 1 in which a non-return valve is provided upstream of the junction of the branch pipe and the ducting to prevent expired gas from flowing back to a patient during the positive phase of operation of the machine.

3. A machine as claimed in Claim 1 or 2 in which the ducting forms part of a closed or an open circuit connected with a face-mask or equivalent means for administering anaesthetic gas to or for ventilating a patient.

4. A machine as claimed in any one of the preceding claims in which the pumping means is a negative phase bellows arranged to be cyclically operated in timed relation to a control valve positioned upstream of said bellows.

5. An anaesthetic machine or ventilator constructed and arranged substantially as described herein and shown in the accompanying drawings.

WALFORD & HARDMAN BROWN,  
Chartered Patent Agents,  
Trinity House,  
Hales Street,  
Coventry,  
Warwickshire.  
Agents for the Applicants.

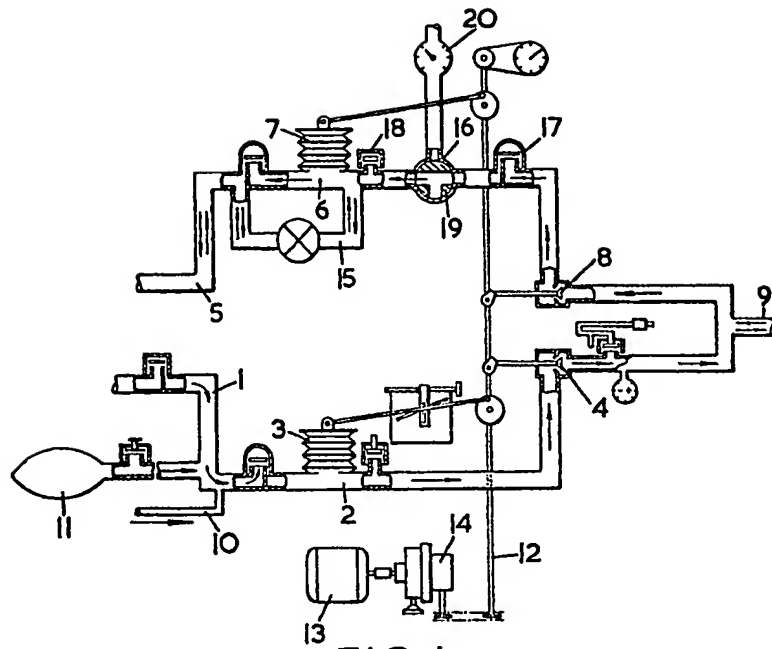


FIG. 1.

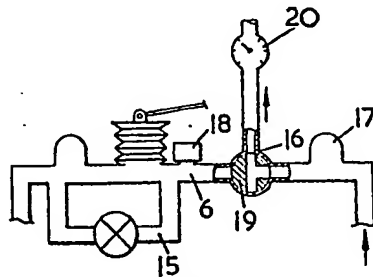


FIG. 2.